

# THE FUTURE OF BIOMEDICAL IMAGING RESEARCH

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AS THE PHYSICIAN'S NONINVASIVE  
WINDOW TO ANATOMY, PHYSIOLOGY  
AND PATHOPHYSIOLOGY, MODERN  
MEDICAL IMAGING HAS BECOME  
ESSENTIAL IN THE PRACTICE OF  
MODERN MEDICINE

- AS DR. ZERHOUNI POINTED OUT YESTERDAY "MEDICAL IMAGING HAS FOUND A PLACE IN VIRTUALLY EVERY SPECIALTY INVOLVED IN MEDICAL PRACTICE"

- WITH THIS BACKGROUND IT SHOULD BE EASY TO PREDICT THE FUTURE OF BIOMEDICAL IMAGING AND BIOMEDICAL RESEARCH.
- WHY THEN DO I HESITATE?



- FOR THE PAST DAY AND A HALF WE HEARD IMAGING SCIENTISTS DESCRIBE THE GREAT ADVANCES THAT HAVE BEEN MADE AND THE EXCITEMENT FOR THE FUTURE.

ALMOST ALL OF THE IMAGING  
SCIENTISTS PRESENT TODAY ARE  
EITHER MEMBERS OF MEDICAL SCHOOL  
IMAGING DEPARTMENTS OR BASIC  
SCIENCE DEPARTMENTS

- ALTHOUGH DISEASE OR ORGAN BASED IMAGING RESEARCH IS CARRIED OUT IN OTHER CLINICAL DISCIPLINES THE CROSS CUTTING ADVANCES WE HAVE BEEN DISCUSSING AT THIS WORKSHOP ARE ALMOST ALWAYS DONE IN DEPARTMENTS OF RADIOLOGY.



UNFORTUNATELY THE RADIOLOGY  
DEPARTMENTS IN THE UNITED STATES  
ARE 'UNHEALTHY' AND VERY POORLY  
POSITIONED TO TAKE ADVANTAGE OF  
THE ENORMOUS OPPORTUNITIES THAT  
WERE PRESENTED DURING THIS  
MEETING.



IN A CONTROVERSIAL INTERVIEW A FEW WEEKS AGO DR. ZERHOUNI POINTED OUT THAT THE " MAJORITY OF ACADEMIC RADIOLOGY DEPARTMENTS ARE BASED ON A CLINICAL TRAINING PARADIGM. I CALL IT THE TRADE SCHOOL PARADIGM"

PERHAPS TO POINT OUT THE DILEMMA  
IN A DIFFERENT WAY :

- 160 ACADEMIC INSTITUTIONS IN THE U.S. RECEIVE NIH SUPPORT
- ONLY 60 RADIOLOGY DEPARTMENTS HAVE ANY NIH GRANTS ,AND ONLY 8 DEPARTMENTS ACCOUNT FOR 50% OF THE GRANT MONEY.

IF CROSS CUTTING, BASIC, BIOMEDICAL  
IMAGING RESEARCH IS GOING TO  
THRIVE THE RADIOLOGY DEPARTMENTS  
ARE GOING TO HAVE TO THRIVE AND  
UNDERGO RADICAL CHANGES.



- (A) IF DEPARTMENTS ARE SERIOUS ABOUT THIS CHALLENGE THEY WILL HAVE TO REORGANIZE AND MAKE MAJOR INVESTMENTS IN FUNDAMENTAL RESEARCH
- (B) RADICAL CHANGE IN IMAGING TRAINING PROGRAMS AND INCORPORATE RESEARCH TRAINING
- (C) INCORPORATE MORE BASIC SCIENTISTS AS RADIOLOGY FACULTY

## HOW CAN THE NIBIB HELP ?

- (A) CREATE INCENTIVES FOR RADIOLOGY TO RECRUIT BASIC SCIENTISTS AND FOR DEPARTMENTS TO PARTICIPATE IN INTERDISCIPLINARY RESEARCH
- (B) CREATE FLEXIBLE TRAINING GRANTS AT THE PRE AND POSTDOCTORAL LEVEL THAT ARE SUITABLE FOR RADIOLOGY TRAINEES
- (C) INCREASE NUMBER OF SHARED INSTRUMENTATION GRANTS THAT CAN HELP BUILD RESEARCH INFRASTRUCTURE AND FACILITATE RECRUITMENT OF BASIC SCIENTISTS.
- (D) UNTIL SUCH TIME AS AN INTRAMURAL BRANCH OF THE NIBIB IS ESTABLISHED ENCOURAGE RESEARCH TRAINING IN THE IMAGING LABS OF THE CLINICAL CENTER.

THE OLD PARADIGM OF DESCRIPTIVE  
IMAGING RESEARCH WILL NOT MAKE  
THE ADVANCES NECESSARY TO ADVANCE  
THE DISCIPLINE.



SUCCESS OF IMAGING RESEARCH WILL  
DEPEND ON ITS ABILITY TO BE CROSS  
CUTTING AND POISED TO ASK  
FUNDAMENTAL RESEARCH QUESTIONS

THE ANSWERS TO THESE QUESTIONS  
WILL GIVE US A BETTER  
UNDERSTANDING OF MOLECULAR  
NETWORKS, CELLULAR IMAGING AND IN  
VIVO DISTRIBUTION OF KEY MOLECULES

MAJOR NEED TO DEVELOP NEW SOURCES  
AND SENSORS AS WELL AS TARGETED  
AGENTS THAT ARE CAPABLE OF IMAGING  
AT THE MOLECULAR LEVEL



BECAUSE OF NEED TO HANDLE THE  
ENORMOUS AMOUNT OF GENERATED  
DATA IT WILL BE CRITICAL TO INVEST  
HEAVILY IN INFORMATICS



VERY LARGE QUANTITIES OF DATA HAVE  
TO BE STORED, MANAGED AND  
ANALYZED.

BY THE DATA BASING OF IMAGES WE  
WILL BE ABLE TO COMPARE FINDINGS  
OVER TIME AND HELP IN THE  
DEVELOPMENT OF COMPUTED AIDED  
DIAGNOSIS.



EVEN THE SUCCESSFUL ACADEMIC  
DEPARTMENTS OF RADIOLOGY WILL  
HAVE TO BECOME INTERDISCIPLINARY  
AND INTERDEPARTMENTAL IF THEY ARE  
TO TAKE ADVANTAGE OF THE  
ENORMOUS OPPORTUNITIES AND  
ENTHUSIASM FOR IMAGING RESEARCH

